

REMARKS

Claims 13-20 and 25-36 were pending in the application. These claims were rejected under 35 U.S.C. 102 over Todorov et al. (U.S. patent no. 6,435,807) and over Whitcomb (U.S. patent no. 6, 468,022). The claims as amended are believed to be allowable over the two references for the following reasons.

Claim 13 recites, in the last paragraph:

... the article has a first, substantially planar, surface facing the rotational member and a second, substantially planar, surface opposite to the first surface, and the end effector contacts the first surface of the article but not the second surface of the article when the device presses the article against the rotational member.

This recitation is supported by Applicants' Fig. 5. The end effector contacts the top surface of wafer 120 but not the bottom surface when the wafer is pressed against pads 340 of rotational ring 270.

One advantage of this embodiment is that the wafer is not gripped at the edges as in Todorov and Whitcomb (discussed below). Therefore, the wafer edge damage (chipping) is unlikely even if the wafer is thin, and the wafer can be secured in the end effector reliably even if the wafer is warped (thin wafers can be warped due to internal stresses, as explained in U.S. patent application no. 09/904,638 published as no. 2003/0018410, in paragraph 0003). Also, when the wafer is rotated for the alignment purposes, the ring 270 does not interfere with the notch or the flat on the wafer's circumference. See Applicants' page 1, line 17, and page 6, lines 1-2.

The claims are not limited to the embodiments or advantages discussed herein.

Todorov's edge gripper 28 (Figs. 3, 4) holds a wafer 34 with rotatable wheels 36, 38, 40 (column 3, lines 6-8). As shown in Fig. 4, the wheels contacting the wafer edges. Todorov does not teach or suggest that the wheels may contact the bottom surface of the wafer but not the top surface of the wafer, or vice versa, as recited in Claim 13.

Whitcomb also teaches an edge-gripping device. Rollers 21a, 21b, 21c (Fig. 3) "snugly grip outside periphery (i.e., the edge) of the wafer". See column 4, lines 57-59. As shown in Fig. 2, the rollers have a "positioning groove 41" which "receives and holds the edge" of wafer 1 (see column 3, lines 32-34). Whitcomb does not teach or suggest that the rollers 21a, 21b, 21c may contact the bottom surface of wafer 1 but not the top surface, or vice versa, as in Claim 13.

Claim 15 is re-written as independent. It recites a device for pressing an article against a rotational member. The device "comprises a vortex chuck to emit a gas vortex towards the article".

Claim 15 is supported by Applicants' Fig. 5. Vortex chucks 230 emit gas vortices towards wafer 120. The vortices create an attraction force that draws the wafer towards the end effector and presses the wafer against the pads 340 of rotational ring 270. Specification, page 3, lines 24-26, and page 4, lines 10-12.

Todorov and Whitcomb do not teach or suggest a vortex chuck as in Claim 15. The two references provide no motivation for adding a vortex chuck to their edge gripping devices.

Claim 16 depends from Claim 15.

Claim 17 recites that “both the rotational member and the article rotate around an axis passing through the article when the rotational member rotates the article”. For example, in Fig. 5, the rotational ring 270 and the wafer 120 rotate around the same axis passing through the wafer.

Todorov’s wheel 40 (Figs. 4, 6) does not rotate the same axis as wafer 34, and further the wheel 40 does not rotate around an axis passing through the wafer 34 when the wheel 40 rotates the wafer. The same is true for wheels 36, 38.

Whitcomb is no more pertinent.

Claim 18 depends from Claim 17.

Claim 19 is re-written as independent. It recites a vortex chuck. See the discussion above in connection with Claim 15.

Claim 20 depends from Claim 19.

Claim 25 depends from Claim 13. Further, Claim 25 recites that the rotational member is movable relative to an end effector body in a direction opposite from the article to yield when the article is held in the end effector and the end effector presses the second surface of the article against a third surface not belonging to the article and not belonging to the end effector.

This recitation is supported by Applicants’ specification, page 6, lines 27-33, stating:

Spring steel plates 310 allow ring 270 and wafer 120 to move up ... if the end effector presses the wafer against some surface ... The surface may be that of a sticky tape, e.g. a dicing tape ... Spring steel plates 310 allow the ring and the wafer to yield ... so wafer damage is avoided.

Todorov does not teach or suggest that his wheels 36, 38, 40 may yield if the gripper presses the wafer against a surface as recited in Claim 25.

Whitcomb is no more pertinent.

Claim 26 depends from Claim 25.

Claims 27-31 depend from Claim 13.

Claims 32-36 depend from Claim 17.

Claim 37 depends from Claim 13, and further recites a device emitting a gas flow.

The device reads on vortex chuck 230. See the discussion above in connection with Claim 15.

Claim 38 depends from Claim 15. In addition, Claim 38 is believed to be allowable for reasons similar to the reasons given above for Claim 25 ("pressing the article against a surface").

Claim 39 depends from Claim 38.

Claim 40 depends from Claim 17, and further recites "a device for emitting a gas flow". See the discussion above in connection with Claim 15.

Claim 41 depends from Claim 17, and further recite a language similar to the language discussed above in connection with Claim 25.

Claim 42 depends from Claim 41.

Claim 43 depends from Claim 19, and further recite a language similar to the language discussed above in connection with Claim 25.

Claim 44 depends from Claim 43.

Claim 45 recites that an article is “stationary relative to the rotational member” when the article rotates.

For example, in Applicants’ Figs. 5 and 10, wafer 120 is stationary relative to ring 270 when the wafer and the ring rotate.

Todorov’s wheels 36, 38, 40 are not stationary relative to wafer 34 when the wafer rotates.

Whitcomb is no more pertinent.

Claims 46-48 depend from Claim 45. In addition, Claims 46-47 are believed to be allowable for reasons similar to the reasons given above for Claim 25.

Claim 49 recites a rotational member “movable relative to the body in a direction opposite from the article to yield when the end effector is holding the article and is pressing the article against a surface not belonging to the article and not belonging to the end effector”. See the discussion above in connection with Claim 25.

Claim 50 depends from Claim 49.

Any questions regarding this case can be addressed to the undersigned at the telephone number below.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on August 28, 2003.

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